



EFFECT OF FISHING ACTIVITIES ON FISHERY RESOURCES IN IKERE-GORGE, ISEYIN, OYO STATE, NIGERIA

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Abstract

The study assessed the effect of fishing gears, fishing regulations on fisheries resources of Ikere-gorge, Iseyin, Oyo State, Nigeria in 2018. The major objective of fishing regulation is to regulate fishing gears for the conservation of fisheries resources. Random sampling technique was used to administer 90 structured interview guides prepared and administered to 50% population of fishermen in each fishing village in Ikere-gorge. Data obtained were analysed with descriptive and inferential statistics. There were six different fishing gears employed by fishermen to exploit fish in Ikere-gorge. Fish are abundant during the rainy season but catch quantities and sizes are decreasing. There were some missing fish species in Ikere-gorge. Fishermen used two inches mesh size net for fishing, leading to abundant by-catch of juvenile fish in Ikere-gorge. Most fishermen were not aware of any law that forbid catching of small-sized fish. Among various reasons for catching small-sized fish include: abundance and monetary gains. There was a negative and significant relationship between fishing gears and fishery resources and positive between fishing regulation and fishery resources in Ikere-gorge. Therefore, fishermen should be encouraged to fish responsibly for the sustainability of Ikere-gorge fisheries.

Keywords: Fishermen, fishing regulation, sustainability, gillnet, mesh size, and by-catch

Introduction

Many fish stocks are now classified as overfished due to continuous overfishing and use of obnoxious fishing methods such as the use of small mesh size, unselective fishing gears, fish poisons and explosives (Olapade *et al.*, 2017). These types of fishing methods are not ecosystem friendly and responsible. This is in contrast to FAO code of conduct which states that the right to fish carries with it the obligation to do so in a responsible manner to ensure effective conservation and management of the living aquatic resources. Therefore, fisheries management should adopt measures to protect biodiversity of aquatic habitats and ecosystems and ensure that endangered species are conserved and protected (FAO, 1995). Ikere-gorge like any other freshwater ecosystems in Nigeria is believed to be a public property. The conservation of freshwater ecosystem and its fisheries resources is believed to be the responsibility of the public. The challenge of this conception is that the public are available to exploit the resources and benefits provided by the freshwater ecosystem, but are unavailable to conserve it. This act

jeopardise the sustainability of the freshwater ecosystem like Ikere-gorge. Government as the representative of the public formulated some policies or laws to regulate human activities and serve as means of conservation and sustainable use of fisheries resources. But, most of these laws are not fully enforced. Therefore, people are greedily, indiscriminately and ignorantly exploit fisheries resources in Ikere-gorge with conservation and sustainability of the dam under threat. However, freshwater fisheries is believed to be key to combating poverty and achieving sustainable development, while improving human health, livelihood, equitable economic growth and sustainable ecosystems (SIWI, 2018). Therefore, this study aims to investigate fishing activities, fishing gears and effects of these on fish abundance and diversity in Ikere-gorge.

Methodology

Ikere-gorge is located between longitude 8°10' and 8°20' N and latitude 3°40' and 3°50' E (Figure 1). There are 12 fishing villages in Ikere gorge inhabited by different people from different ethnic groups in Nigeria

and neighbouring countries like Togo, Mali, and Republic of Benin. The predominant languages of communication are Hausa, Igala, Igbo and Yoruba. The people depend on fishing activities for their livelihood. There are 183 registered fishermen distributed randomly across the 12 fishing villages in Ikere-gorge (Table 1). Random sampling technique was used to administer 90 structured interview guides prepared and administered to 50% of the population of fishermen in each fishing village. The interview guide was designed to collect information on status of fishery resources, fishing gears and fishing regulation in Ikere-gorge. The interview guides were administered with respect to the number of fishermen in each of the twelve recognised fishing villages. Two fishermen were employed to help in administering the interview guides and interpret the information to the fishermen in their local language. Out of 90 structured interview guides administered, 77 were elicited and analysed. Also, focus group discussion (FGD) and observation were employed to obtain more

information about the fishermen and fishing activities. Data obtained from interview guide, observations and contact interview were analysed with descriptive and inferential statistics using IBM SPSS Statistics 20. The response of the fishermen in each variable were weighted e.g. Yes = 1; No = 0 and in multiple answers 1, 2, 3.. Then these were summed up together and analysed with aid of SPSS. The effect of fishing gears and fishing regulations on fisheries resources was analysed with the aid of the correlation matrix specified thus:

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n(\sum x^2) - (\sum x)^2] - [n(\sum y^2) - (\sum y)^2]}}$$

Where;

r = Correlation coefficient

x = Fishing gears/fishing regulations

y = Fisheries resources

n = Number of respondents

Table 1: Fishing villages and registered number of fishermen in Ikere-gorge

Fishing Villages	Number of registered fishermen
Spillway	40
Dwelling camp	7
Bendel	5
Agatu	15
Dobe	10
Asamu	40
Alagbede	20
Apata	4
Irawote	12
Owu	5
Saka	5
Alagbon	20
Total	183

Results and Discussion

Assessment of fishing gears, fishing regulations and fisheries resources was examined in this study. The results in Table 2 shows the various fishing gears used in the study area. The result shows that all fishermen in Ikere-gorge used dug-out canoe for fishing operation (Figure 1). This is in agreement with the findings of Kigbu *et al.*, (2014) about the fishermen in Lake Feferuwa Nasarawa State, North Central, Nigeria. In addition to canoe, some fishermen have calabash (i.e. gourd or large calabash with holes on top) as fishing craft (Figure 2), following Abiodun *et al.* (2005), who reported using gourds in place of canoes in Sabke Lake. Fishing gear can be described as any kind of equipment used in harvesting, cropping, or capturing fish from any water body, while fishing method is how the gear is used. The efficiency of fishing gears is with respect to the level of technology and increase as the level of demand for fish increases. There were six different fishing gears employed by fishermen to exploit fish in Ikere-gorge, corroborating the observation of Adesulu and Sydenham (2007) on the types of fishing gears used and the way they are operated in Nigeria. However, Bawa *et al.*, (2019) reported a total of 11 different types of fishing gears in inland waters of Kebbi State, North-West Nigeria. Udolisa *et al.*, (1994) indicated that Nigerian

fishermen use about twenty seven (27) different types of fishing gears. Many of these fishing gears are destructive, not sustainable and ecosystem friendly. Gillnet is the most common and effective among the fishing gears in the study area along with gura net. This is in agreement with the findings of Kigbu *et al.*, (2014). Some fishermen used more than one fishing gears to catch fish. Majority (85.7%) of the fishermen used gillnet for fishing (Figure 3); 59.7% cast net (throw net, Figure 4); 49.4% hooks (Figure 5); 45.5% gura net (Figure 6); 32.5% wire (Figure 7) and 16.9% used bamboo (kolobo) for fishing (Figure 8).

Many (36.4%) fishermen agreed that gillnet and gura net were the most effective fishing gears in Ikere gorge, followed by cast net (26%) and bamboo (1.2%). Majority (77.9%) of the fishermen used two inches (2 fingers or 5.09 cm) mesh size net for fishing, 14.3% used mesh size greater than three inches (3 fingers or 7.6 cm) while 7.8% used 1 inch mesh size net for fishing. Although, the recommended mesh size for fishing is 3 inches or 7.62 cm (Ita, 1993; Abiodun and Miller, 2007; Ajagbe *et al.* 2017; Olapade *et al.*, 2017). Likewise, Abiodun and Miller (2007) had earlier reported that gill nets should not be less than 3 inches size to protect the spawning stock of commercially valued species.

Table 2: Fishing gears using in Ikere-gorge, Iseyin, Oyo State, Nigeria

Variables		Frequency	Percentage (%)
Fishing vessel	Canoe	77	100
Types of fishing gear:	Gillnet – Yes	66	85.7
	No	11	14.3
	Cast net – Yes	46	59.7
	No	31	40.3
	Hook – Yes	38	49.4
	No	39	50.6
	Gura net – Yes	35	45.5
	No	42	54.5
	Wire – Yes	25	32.5
	No	52	67.5
	Bamboo – Yes	13	16.9
	No	64	83.1
Most effective gear:	Cast net	20	26.0
	Gura	28	36.4
	Gillnet	28	36.4
	Bamboo	1	1.2
Mesh size using:	1 finger	6	7.8
	2 finger	60	77.9
	>3 finger	11	14.3
	Methods of discarding used nets:	Abandon in the dam	29
	Burn them	15	19.5
	Abandon into bush	33	42.8

Source: Field Survey, 2018



Figure 1: Canoe operation in Ikere-gorge



Figure 2: Calabash (gourd) used for fishing



Figure 3: Gillnet operation in Ikere-gorge



Figure 4: A fisherman mending cast net



Figure 5: Hook operation in Ikere-gorge



Figure 6: Gura net operation in Ikere-gorge



Figure 7: Wire net in Ikere-gorge



Figure 8: Bamboo in Ikere-gorge

For treatment of used netting materials, about 37.7% of the fishermen abandoned their used netting materials in the dam (Figure 9), 19.5% burnt them, while 42.8% abandoned them in the bush. But lost or abandoned fishing gears constitute increasing problems of great concern in aquatic ecosystem. The major effect of these abandoned fishing gears in water bodies is ghost fishing (continued catch or mortality of fish of various sizes) as

shown in Figure 10. This contributes to loss of biodiversity. Other effects are alterations to the benthic environment; navigational hazards; pollution of aquatic ecosystem; introduction of synthetic material into the aquatic food web and a variety of costs related to clean-up operations and impacts on business activities (Macfadyen, *et al.*, 2009; Link *et al.*, 2019).



Figure 9: Abandoned netting material



Figure 10: Ghost fishing in Ikere-gorge

There are technical regulations on fishing gears to avoid catching of small-sized fish (juvenile fish) and to obtain the overall goal of high-sustainable yield in the fisheries of Ikere-gorge. Surprisingly, there is abundant by-catch (small-sized fish) in the catch of many fishermen in Ikere-gorge. A number of fishermen were found using small mesh nylon mono-filament gill nets and Malian fish traps (Gura) of less than 2 inch mesh sizes. Table 3 shows the assessment of fishing regulations in Ikere-gorge. Majority of the fishermen were aware of fishing regulations, paid and collected fishing licence permit in the study area. Majority (77.9%) of the fishermen agreed that licence fee for fishing permit in Ikere-gorge cost ₦5000.00 per annum. Most (90.9%) of the fishermen also noted that Ikere-gorge is open and closed once a year. Majority (75.3%) of the fishermen indicated that closing and opening of the dam had no effect on fishing and on the fish in the dam. However, many (50.6%) fishermen preferred opening of Ikere-gorge dam, 48.1% preferred closing of the dam while 1.3% are indifferent. Many (59.7%) fishermen indicated that the

recommended mesh size for fishing in Ikere-gorge is two inches (2 fingers), 19.5% three inches (3 fingers), 5.2% four inches (4 fingers), while 15.6% had no knowledge of the recommended mesh size for fishing in Ikere-gorge. Many fishermen violated Ikere-gorge fishing regulations, and fish with illegal fishing gears that increase bycatch of juvenile fish, destructive to fishery resources and biodiversity. For example, *Lates niloticus* can grow up to 100 kg (Olaosebikan and Raji, 2013). Although, many juvenile of *Lates niloticus* were caught with total length of about 9.9 cm and total weight of 9 g, leading to increase in overfishing in Ikere-gorge. This shows that fishing regulations in Ikere-gorge are not enforced. This is in agreement with the report of Ita (1993) that fishing in African lakes, rivers and their associated wetlands is usually haphazard; there are usually no laws and regulations controlling the exploitation of the fisheries of most African inland waters. Even where such laws and regulations exist, they are not often enforced.

Table 3: Assessment of fishing regulations in Ikere-gorge, Iseyin, Oyo State, Nigeria

Variables		Frequency	Percentage (%)
There is fishing regulations	Yes	54	70.1
	No	23	29.9
Collection of license permit:	Yes	64	83.1
	No	13	16.9
Cost (₦) of license permit:	₦3,000	9	11.7
	₦4,000	8	10.4
	₦5,000	60	77.9
Open / close of dam (per year):	Once	70	90.9
	Twice	7	9.1
Open /close of dam has effect:	Yes	58	75.3
	No	19	24.7
Preference to open /close:	Opening	39	50.6
	Closing	37	48.1
	Indifferent	1	1.3
Recommended mesh size:	No size	12	15.6
	2 fingers	46	59.7
	3 fingers	15	19.5
	4 fingers	4	5.2

Source: Field Survey, 2018

Food and Agriculture Organization (FAO) Code of Conduct Article 6.6 notes that 'selective and environmentally safe fishing gear and practices should be further developed and applied, to practicable extent, in order to maintain biodiversity and to conserve the population structure and aquatic ecosystems and protect fish quality'. It must be bear in mind that conservation and sustainability of fishery resources is a collective responsibility of all stakeholders. FAO Code of Conduct Article 6.1 notes that 'the right to fish carries with it the obligation to do so in a responsible manner to ensure effective conservation and management of the living aquatic resources' (FAO, 1995).

The results in Table 4 show the status of fishery resources in Ikere-gorge. Majority (81.8%) of the fishermen indicated that there is abundant catch of fish during the raining season, and 11.7% and 6.5% noted dry season and indifferent respectively. Many (44.2%)

fishermen indicated that there were some fish species that are missing among the fish resources in Ikere-gorge. Fishermen indicated high abundance of some fish species in the early history of Ikere-gorge but their abundance has decreased. Majority of the fishermen disagree that catch quantity and sizes are increasing. The result shows that 28.6% of the fishermen catch small-sized fish, 18.2% medium sized, while 53.2% catch all sizes of fish. Majority (66.2%) of the fishermen indicated that small-size gillnet is used to catch small sized fish, while 33.8% indicated gura. Among various reasons for catching small-sized fish include: small sized fish are in abundant (39%), fishermen catch small-sized fish when they are in need of money (9.1%) and they catch small-sized fish due to the design of their fishing gears (51.9%). Majority (62.3%) were not aware of any law that forbid catching of small-sized fish. Many (55.8%) fishermen have more than 61% of their catch as small-size fish. Therefore, there is abundant by-catch of juvenile fish in Ikere-gorge (Figure 11).

Table 4: Status of fishery resources of Ikere-gorge, Iseyin, Oyo State, Nigeria

Variables		Frequency	Percentage (%)
Abundant catch of fish:	Rainy season	63	81.8
	Dry season	9	11.7
	Both	5	6.5
Some fish are missing:	Yes	34	44.2
	No	43	55.8
Catch quantity is increasing:	Yes	20	26.0
	No	57	74.0
Catch size is increasing:	Yes	23	29.9
	No	54	70.1
Size of fish catch:	Small size	22	28.6
	Medium	14	18.2
	All sizes	41	53.2
Fish gear catching small fish:	Gura	26	33.8
	Small mesh gillnet	51	66.2
Reasons for catching small fish	Small fish in abundant	30	39.0
	In need of money	7	9.1
	Design of gear	40	51.9
Law forbid catching of small fish:	Yes	29	37.7
	No	48	62.3
% of small sized fish in catch:	0 – 20	8	10.4
	21 – 40	10	13.0
	41 – 60	16	20.8
	>61	43	55.8

Source: Field Survey, 2018



Figure 11: By-catch issue at Ikere-gorge

Results in Table 5 show a negative and significant (5%) relationship between fishing gears and fishery resources, but positive between fishing regulation and fishery resources in Ikere-gorge. This shows negative and unsustainable impact fishing gears have on the fishery resources in Ikere-gorge. Bjordal (2009) highlighted some criteria for ideal fishing gear but concluded thereafter that the ideal fishing gear does not exist, as any fishing gear fulfils the complete list of the desired criteria and properties. Although, fishing must be done and it must be done responsibly as required by FAO (1995). Significant positive relationship between fishing regulations and fishery resources in Ikere-gorge is an indication that these regulations are aimed to

protect the fishery resources of Ikere-gorge. It shows that as fishermen continue and increasingly keep the regulations, the more the growth and more sustainability of the enterprise. This observation is in agreement with Bjordal (2009) who indicated that technical regulations are to obtain the overall goal of sustainable yield in fisheries. These regulations are to improve the selectivity properties of fishing gears to mitigate against bycatches and mortality of juvenile fish; thereby larger percentage of recruited fish stock enters into the population of fish stock of Ikere-gorge. Fisheries laws, edict and regulations by various legislations at Federal, State and Local government level in Nigeria is to encourage responsible fisheries management

approaches as intervention. The overall goal is that through implementation of these laws and regulations, the biodiversity, catch, fish quality to consumers; the markets and transportation of fish are within acceptable safety and public health standards.

Nearly all causes of overfishing can be traced to the level of technology employed to exploit fishery resources. Although, human needs or demands drive technology, while the later drive overfishing. Therefore, as human

demands increases, technology increases and rate of overfishing increases. Olapade *et al.*, (2017) reported that overfishing in Nigeria's inland capture fisheries began with introduction of synthetic fishing materials such as polyamide (nylon), polyester, polyethylene etc. Traditional materials for fishing have been replaced by modern ones which have increased fishing gears catching ability and the most obvious effect is the depletion of some natural fish stocks.

Table 5: Correlation matrix of fishing gears in Ikere-gorge, Iseyin, Oyo State, Nigeria

	FG	FR	FRS
FG	1		
FR	0.08	1	
FRS	-0.25*	0.26*	1

*Correlations is significant at the 0.05 level (1 – tail)

Key: FG= Fishing Gear ; FR= Fishing Regulations; FRS= Fishery Resources Status

Conclusion

Fisheries in Nigeria are a common property resource. As such, they are subject to possible over-exploitation in the absence of proper management. Although, there is no ideal fishing gear that will have no detrimental effect, but any gear use must be with caution and responsibly to reduce its effect on the aquatic ecosystem. Fishing regulations are to regulate the fishing gears used for fish exploitation and to protect and conserve fishery resources. The fishing activities in Ikere-gorge are not sustainable. This is due to non-selectivity of most of gears used for the exploitation of fish in the gorge. Fishing regulations are not fully enforced. Most fishermen use lower mesh size below the recommended size. This encourages exploitation of fingerlings and juvenile fish that had not recruited into Ikere-gorge fisheries. Also, the method of disposing their used netting materials into gorge allow ghost fishing which is not healthy for the fisheries of Ikere-gorge. Therefore, the fishermen of Ikere-gorge should be trained on the consequence of their activities on fishery resources. They should be encouraged to fish responsibly for sustainability of Ikere-gorge fisheries.

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